An Echocardiographic Evaluation of Patients With Idiopathic Heart Failure*

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The primary myocardial disease idiopathic dilated cardiomyopathy (IDCM) is not clearly defined in the literature. The description is both morphologic and etiologic. We examined consecutive patients with congestive heart failure (CHF) of unknown cause to identify possible cases of IDCM and to give a detailed description of echocardiographic data and possible diastolic dysfunction in this group. The hospital records of patients aged 16 to 65 years hospitalized due to CHF or IDCM during a 6-year period (N=2,711) were evaluated in a defined region of western Sweden. Twenty-two percent (584/2,711) of these records contained no plausible cause of CHF or IDCM, and among patients being alive, obvious cause was lacking in 411 of 1,516 (27%). These 411 patients were offered a diagnostic investigation, including echocardiography, and they were compared with a randomly selected control group (n=103) from the general population. Of 411 patients, 293 accepted investigation. From the control group, we defined the reference level for left ventricular (LV) dilatation to be >32 mm/m², and reduced ejection fraction according to Teichholz formula to be <50%. Applying these borderlines, we identified LV dilatation and systolic dysfunction to be present in 30%, either dilatation or systolic dysfunction in 36%, and neither in 34%. In patients without any signs of systolic dysfunction 44% (26/59) showed signs of diastolic dysfunction. In a multivariate analysis, LV dimension was not independently correlated to disease, although LV dimension was univariately correlated to ejection fraction (EF) (r=-0.59; p<0.0001). However, EF (p<0.0001), left atrial dimension (p<0.0001), and the first third filling fraction (p<0.0001) were the constellation of parameters that most accurately separated patients from controls. By using these three parameters, a positive and negative predictive accuracy of 98% and 61%, respectively, was achieved. Thus, in a consecutive group of patients with idiopathic CHF recruited from a nonselected group of hospitalized patients with CHF, all grades of ventricular function were found. In this group, 30% were identified as having IDCM. We give reference values for the diagnosis of idiopathic IDCM and a simple tool to identify patients with systolic and diastolic dysfunction. (Chest 1995; 107:680-89)

**Idiopathic dilated cardiomyopathy (IDCM)** is a commonly used but poorly defined term. Although the clinical entity of a dilated left ventricle (LV) with poor contractility is well recognized by every cardiologist, the term IDCM is often used without consideration of the fact that it is both descriptive and etiologic. In the latter respect, it constitutes an exclusion diagnosis. No particular measurement defines IDCM. A thorough investigation is necessary to exclude other etiologies. To our knowledge, there has been no previous report on echocardiographic findings of IDCM among consecutive patients with congestive heart failure (CHF). The primary objective of the present study was to determine the frequency of idiopathic CHF subcategorized into those with echocardiographic IDCM and those with isolated diastolic dysfunction as a cause of heart failure symptoms. Secondary objective was to give a detailed echocardiographic description of functional abnormalities associated with a previous clinical diagnosis of idiopathic CHF.

**METHODS**

The present study recruited patients from the world's largest population of unselected patients with CHF.

**Primary Medical Record Investigation**

A survey of all 16- to 65-year-old patients hospitalized due to CHF or IDCM in 1980 through 1987 in the western region of Sweden was performed in 1985 to 1988. Among 1.64 million people in the region, 1.05 million were 16 to 65 years of age. All hospitals in the area participated in the study. During the study period, 2,711 patients were hospitalized due to CHF or IDCM. After exclusion of possible causes of CHF, 584 patients with CHF of unknown origin remained, 202 of whom had been given a diagnosis of IDCM. Of the 584 patients 173 were reported dead at the time of screening, and the remaining 411 patients were

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BSA=body surface area; CHF=congestive heart failure; EF=ejection fraction; EFSSE-point septal separation; FTFF=first filling fraction; IDCM=idiopathic dilated cardiomyopathy; LA=left atrial; LV=left ventricle; NDCM=nondilated cardiomyopathy

**Key words:** congestive heart failure; dilated cardiomyopathy; diastolic function; echocardiography; epidemiology; ventricular function.
Adequate echocardiogram

Possible etiology

Alive

Accepted investigation

Adequate echocardiogram

Total population

16 - 65 years old

Hospital records

CHF/IDCM

1.64 million

1.05 million

2711 (2461)

584 (532)

2127 (1929)

411 (391)

173 (141)

1105 +

1022 -

293 (278) +

118 (113) -

286 (271) +

7 (7) -

FIGURE 1. The flow scheme of the screening procedure. The total number of patients is given in the boxes, with patients who experienced their first hospitalization during the study period in parentheses.

Secondary Clinical and Echocardiographic Investigation

The western region of Sweden is served by 19 hospitals, and the patients were invited to investigation at their local hospital. All patients were examined by one investigator (B.A.) and one assistant. The patients had a physical examination and answered a questionnaire concerning symptoms, medical history, treatment, smoking, and alcohol consumption. Experience of dyspnea and chest pain was registered according to the questionnaire of Rose and Blackburn. The Minnesota Classification was used to classify the resting ECG. The local echocardiographic equipment was used, which included machines of several manufacturers (Acuson, ATL, Irex III, and Vingmed). Most examinations were performed on one of two scanners (Acuson or Irex III). M-mode and two-dimensional examination was performed with the patient in the left lateral position. M-mode measurements were made according to the recommendations of the American Association of Echocardiography. Evaluations and calculations of M-mode tracings were performed by two independent investigators who were blinded from clinical data of the patients. Ejection fraction (EF) according to the Teichholz et al formula and LV mass were calculated from the LV M-mode tracings. To evaluate LV diastolic function, the first third filling fraction (FTFF) (atrial emptying index) was calculated from the echocardiogram of the aortic root. Aortic root motion, wall dimensions, mitral valve E-point septal separation (EPSS), and LV dimensions were performed from strip-chart recordings. However, in some centers where the echocardiographic equipment lacked a strip-chart recorder, LV measurements were performed by means of calipers on the video screen. The two-dimensional investigations were stored on videotape and subsequently analyzed by a blinded observer. The degree of chamber dilatation, gross myocardial hypertrophy, general and regional LV function, and valvular disorders were examined. The regional wall motion was interpreted to determine the presence of severe hypokinesia or akinesia as previously described.
**Statistical Analysis**

The normal range of each echocardiographic parameter was defined as the range between the 2.5th and the 97.5th percentile in the control group. Measurements are presented as mean ± SD. The covariance of various echocardiographic measurements was tested by linear regression. A stepwise multivariate selection was used to identify echocardiographic variables that could separate diseased from nondiseased hearts. The ability of different echocardiographic variables to identify heart disease was determined from the combined group of patients and controls. The nosologic sensitivity and specificity were determined, as well as the positive predictive accuracy and the negative predictive accuracy. Differences between means were tested by a two-tailed unpaired Student t test for parametric data and the Wilcoxon test for non-parametric data. Differences between proportions were tested by the χ² test.

**Results**

The investigation of the 293 patients with CHF of unknown cause was performed 44±23 months (range, 5 to 99 months) after their first admission to the hospital due to heart failure. A previous echocardiographic recording was available in 87 of 293 (30%) patients. Satisfactory M-mode or two-dimensional recordings could be obtained in 254 of 293 (87%) and 273 of 293 (93%) patients, respectively, whereas either recording could be adequately assessed in 286 of 293 (98%). Three patients were confined to wheelchair or bed, which resulted in lack of reliable weight measurements. Because of this, M-mode values adjusted for body surface area could only be calculated in 251 patients. The two-dimensional echo revealed signs of regional LV dysfunction (akinesia or dyskinesia) in 17 of 273 patients (6.2%).

**Secondary Cardiomyopathies**

Patients with previously known hypertrophic cardiomyopathy, valvular disorders, or alcoholism had been excluded at the primary medical record investigation. The investigation did not reveal any patient with classic hypertrophic cardiomyopathy. Echocardiography or interview disclosed possible causes of heart failure in 11 patients. Thus, previously undiscovered valvular disease was found in seven patients: mitral insufficiency in one, mitral stenosis in two, and combined aortic valvular dysfunction in four patients. Excessive alcohol consumption was revealed in another three patients. One patient had a history of irradiation against a breast tumor, in which case there might have been a causal relationship. Exclusion of these 11 patients with secondary CHF from further analysis reduced the patient group to 275 patients with idiopathic CHF or IDCM.

**Echocardiographic Data**

The findings of the M-mode investigations are shown in Table 1, as well as the values from the control group. The distribution histograms of LV end-diastolic diameter and EF are depicted in Figure 2. Since LV end-diastolic dimension was significantly correlated to body surface area (BSA) in the patients with CHF (r=0.29; p<0.0001) as well as in the control group (r=0.37; p=0.0004), we have corrected for BSA in dimensional data.

By univariate correlation analysis, EF was significantly correlated to the indices of LV dimension (Fig 3). New York Heart Association (NYHA) showed weak, but significant, correlation to FTFF (r=−0.21; p=0.002), to LV end-systolic diameter (r=0.17; p=0.02), and EF (r=−0.16; p=0.02).

The 2.5th to the 97.5th percentile of the measurements in the control group was used as reference values to determine extent of cardiac dysfunction in patients with symptomatic heart failure of unknown cause. We subdivided the patients into two groups, 83 patients with IDCM (30% of 275), and 192 patients without IDCM, non-dilated cardiomyopathy (NDCM) (70% of 275). The IDCM group was defined as those having LV dilatation and reduced EF. The NDCM group thus comprised patients with idiopathic myo-

**Table 1—M-Mode Echocardiographic Data (Mean ± SD) in 275 Patients With Idiopathic Heart Failure and in 103 Healthy Control Subjects***

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Study Group, n=275</th>
<th>Healthy Controls, n=103</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>p Value</td>
</tr>
<tr>
<td>Left ventricular end-diastolic diameter, mm/m²</td>
<td>32±5.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Left ventricular end-systolic diameter, mm/m²</td>
<td>25±7</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Left atrial diameter, mm/m²</td>
<td>24±4.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Left ventricular wall diameter, mm</td>
<td>10±2.2</td>
<td>0.64</td>
</tr>
<tr>
<td>Left ventricular wall to end-diastolic diameter ratio</td>
<td>0.32±0.08</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Left ventricular mass, g/m²</td>
<td>109±31</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>E-point septal separation, mm</td>
<td>14±9.6</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>First third filling fraction</td>
<td>0.72±0.23</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Ejection fraction, %</td>
<td>44±17</td>
<td>&lt;0.0001</td>
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</tbody>
</table>

*The normal values of the control groups are defined as the range between the 2.5th and the 97.5th percentile. The p values denote the statistical difference between the two groups.

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cardiac dysfunction but not fulfilling the criteria of IDCM with both dilatation and systolic dysfunction. Among the 83 patients with IDCM, 52 had a previous diagnosis of IDCM while 31 were revealed by our investigation. In the NDCM group, 98 patients (36% of 275) had signs of abnormal ventricular function, either LV dilatation with normal EF (18 patients) or low EF with normal dimensions (80 patients). Further, 94 of 275 (34%) had normal LV end-diastolic diameter as well as normal EF. In 30 of 87 patients with a former echocardiographic evaluation, the ventricular function had improved as defined by an increase in EF by 0.10 U or more, whereas the conditions of 14 patients had deteriorated.

Diasstolic function, as measured by an increased left atrial diameter and reduced FTFF, was significantly decreased among the patients with CHF as compared with the controls. In the NDCM group, LV mass was lower than in the IDCM group (Table 2). The LV ventricular wall to end-diastolic diameter ratio was normal among patients with NDCM, but decreased in patients with IDCM. Despite normal LV end-diastolic diameter and EF, 13 of the 85 patients (with interpretable M-mode recordings) in the NDCM group presented signs of reduced systolic function, by either enlarged LV end-systolic diameter or an increased EPSS. When these 13 patients were excluded from analysis, among the remaining 72 patients, left atrial (LA) diameter, LV wall diameter, FTFF, and LV mass could all be evaluated in 59 patients. In this group with no signs of reduced LV systolic function, 26 of 59 (44%) had at least one diastolic parameter outside the normal range. In the group with isolated diastolic dysfunction, the correlation analysis revealed significant correlations between FTFF and heart rate (r = −0.59; p = 0.002), between LA diameter and dyspnea (r = 0.46; p = 0.02),
and between heart rate and L.V wall diameter (r = -0.43; p=0.03).

Markers of Disease vs Nondisease

The identification of “LV disease” by application of reference limits from the control group was evaluated by various noninvasive measures. Reduced EF and increased LV diameter as markers of heart disease identified 76 patients and 1 control subject in the combined group of patient and controls with adequate M-mode echocardiograms (Table 3). Using only EF as marker of disease identified 138 patients and 3 controls. In a multivariate stepwise procedure, only EF (p<0.0001), LA diameter (p<0.0001), and FTFF (p<0.0001) were significant identifiers of diseased vs nondiseased. Setting disease as 1.0 and nondiseased as 0, the regression formula was 0.993–0.01034×EF+0.266×LA–0.478×FTFF. Using this formula as a diagnostic test, with disease defined as >0.50, sensitivity became 92%, specificity 84%, positive predictive accuracy 93%, and negative predictive accuracy 80%. A simpler and more useful way would be to use the normal values of EF (<50%), LA diameter (>25 mm/m^2), and FTFF (<0.54) to identify disease (Table 3).

### Table 3—Sensitivity and Specificity of Different Echocardiographic M-Mode Variables Used as Instruments to Identify Patients With Heart Failure*

<table>
<thead>
<tr>
<th>Combined parameters</th>
<th>Nosologic Sensitivity, %</th>
<th>Nosologic Specificity, %</th>
<th>Positive Predictive Accuracy, %</th>
<th>Negative Predictive Accuracy, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF &lt;50%</td>
<td>32</td>
<td>99</td>
<td>99</td>
<td>34</td>
</tr>
<tr>
<td>LVEDD &gt;32 mm/m^2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EF &lt;50% or LAD &gt;25 mm/m^2 or FTFF &lt;0.54</td>
<td>74</td>
<td>97</td>
<td>98</td>
<td>61</td>
</tr>
<tr>
<td>Isolated parameters</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EF &lt;50%</td>
<td>57</td>
<td>97</td>
<td>98</td>
<td>44</td>
</tr>
<tr>
<td>LVEDD &gt;32 mm/m^2</td>
<td>39</td>
<td>97</td>
<td>97</td>
<td>36</td>
</tr>
<tr>
<td>LVESD &gt;22 mm/m^2</td>
<td>56</td>
<td>99</td>
<td>99</td>
<td>45</td>
</tr>
<tr>
<td>LAD &gt;25 mm/m^2</td>
<td>31</td>
<td>100</td>
<td>100</td>
<td>37</td>
</tr>
<tr>
<td>EFSS (&gt;10 mm)</td>
<td>56</td>
<td>100</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>FTFF &lt;0.54</td>
<td>22</td>
<td>100</td>
<td>100</td>
<td>34</td>
</tr>
</tbody>
</table>

*LAD=left atrial diameter; LVEDD=left ventricular end-diastolic diameter; LVESD=left ventricular end-systolic diameter. The different variables were used in a combined group of patients and controls to differentiate disease vs nondisease.
To our knowledge, this is the first investigation showing that there is a continuous spectrum of LV dysfunction present among patients with a history of CHF. In patients without LV dilatation and with no signs of systolic dysfunction, 44% had impaired diastolic function and/or LV hypertrophy. Reduced EF, increased LA diameter, or reduced first third FTFF could identify patients with CHF with good sensitivity and specificity.

**Etiologic Definition of Dilated Cardiomyopathy**

The term IDCM comprises the meaning of unknown etiology, and therefore the frequently used idiopathic prefix. A lot of effort has been laid into the search of the primary origin of IDCM, and the entity has been reduced somewhat owing to improved diagnostic tools. In the future, several hitherto unknown causes will probably be identified. Almost all heart disorders, such as ischemic heart disease, hypertensive heart disease, valvular disease, alcohol or drug abuse, cytotoxic treatment, and several systemic diseases can lead to CHF and a morphologic picture

**DISCUSSION**

We describe the echocardiographic findings from 293 of 411 survivors among 586 consecutive patients hospitalized due to idiopathic CHF or IDCM in a well-defined region of Sweden. In this group, 30% presented signs of both reduced EF and LV dilatation consistent with the description of IDCM. Left ventricular dimensions showed a close relationship to EF.
indistinguishable from IDCM. In the present study, we tried to exclude all known causes of CHF, including alcohol-related CHF. The remaining 411 patients in the study thus had idiopathic CHF according to diagnostics of today. Coronary artery disease is probably, besides alcohol, the strongest confounding factor. We believe that this is the first study in which an attempt has been made to estimate the proportion of coronary heart disease in a consecutive population of patients with apparently idiopathic CHF. In the substudy, we were able to show that only 16% of patients diagnosed as having IDCM had significant coronary artery obstruction on angiography (unpublished results). However, neither noninvasive investigations nor symptoms, such as chest pain, Q waves, LV regional akinesia, or exercise-induced ST depressions could distinguish these patients with ischemia from the patients with IDCM.

**LV Dilatation and Systolic Function**

There is no exact morphometric definition of IDCM in the literature. Most studies have used only a general description of ventricular function or arbitrary chosen limits of EF and LV dilatation. In a recent report, Manolio et al. proposed guidelines as how to define IDCM. They suggested EF to be <45% and LV end-diastolic diameter to be >2.7 cm/m², however, without references. It is noteworthy that in our control group, the average value of LV end-diastolic diameter was 2.7 cm/m², and the upper normal range was as high as 3.2 cm/m². No study has used a proper control group, which has been investigated by the same method as the patient group. This is essential, as different methods, ie, one- and two-dimensional echocardiography, angiography, nuclear angiography, give different values of EF and LV dimensions. It is also apparent from the results of this study that LV dimension and EF are completely continuous variables, and the delineation of an abnormally dilated heart is highly dependent on proper reference values. Furthermore, an appropriate correction for BSA is necessary, as LV size is significantly correlated to BSA both in patients and in controls. It has been suggested that systolic dysfunction does not exist until the EF falls below 40%. More than half of our patients with past or present CHF had an EF above 40%, which is in accordance with previous studies. It has been suggested that LV end-systolic diameter would be a more sensitive measurement with regard to ventricular dilatation and prognosis, although others have come to conflicting results. In our study, EF was one of the parameters that separated patients from controls, whereas LV dilatation did not. There was a considerable overlap in LV diameter measurements between patients and controls, and most of the patients had normal LV diameter. Additionally, it is important to stress that echocardiographic findings of reduced EF and LV dilatation are not specific for IDCM, and do not exclude an ischemic, alcoholic, or viral etiology.

**Diastolic Dysfunction**

Isolated diastolic dysfunction has been shown to be part of the spectrum of CHF. However, it is difficult to define a state of diastolic dysfunction solely based on an echocardiographic investigation. The diastolic function is very complex and is influenced by several factors, such as age, systolic function, heart rate, atrioventricular pressure gradient, preload, and mitral regurgitation. The additional apprehension of compliance and pressures is necessary to describe fully the diastolic performance of the ventricles. In addition to FTFF, increased LV wall thickness, and thickness to LV dimension ratio, we used LA dimension as a measure of diastolic dysfunction. The Doppler technique was not available on all echocardiographic scanners, and we cannot exclude influence also from mitral regurgitation on LA dimension in some cases. Further, pulsed-wave transmitral Doppler has become a popular tool to evaluate diastolic function. However, there is a phenomenon of “pseudo-normalization” of the E/A ratio among patients with severe LV dysfunction, by which the method is very difficult to interpret in a larger population. The FTFF used in this study was clearly reduced in patients with severe LV dysfunction, as well as in patients with normal systolic function. There are other reports suggesting that analysis of LV motion may disclose abnormal diastolic function, where Doppler registration is still normal. In the present study, 44% of the patients without LV dilatation and with normal systolic function had signs of impaired diastolic function or LV hypertrophy. If CHF is present with normal EF, it has been considered as evidence of diastolic dysfunction. If LA dilatation or a reduced FTFF was added to EF, the efficacy of the diagnostic test improved substantially. This reflects the ability of these two latter variables to identify diastolic CHF.

**Defining Dilated Cardiomyopathy**

In the NDCM group was a subgroup of patients with either dilatation or impaired EF. This type of cardiomyopathy has previously been characterized as “mildly dilated cardiomyopathy” in a small study, and later studies have also paid attention to this condition. In these studies, however, the patients were subjected to selection based on LV function before entering the study, and the investigated groups have therefore probably not been represen-
tative of a larger population with CHF. In the present study, some investigated patients were selected by a previous diagnosis of IDCM, but most patients were selected on the basis of a previous episode of CHF. Although one third of the patients fulfilled the criteria of IDCM with both LV dilatation and reduced EF, most of the patients had less disturbed LV function. We therefore suggest the nomenclature to be NDCM. “Mildly dilated cardiomyopathy” is not an appropriate term to characterize these patients, because most of them have normal dimensions with reduced EF or diastolic dysfunction with normal EF and LV dimensions. In this study, there were 18 patients with LV dilatation but normal EF. These patients were “dilated” but nevertheless were classified as having NDCM, because they did not fulfill the criteria of IDCM with both reduced EF and dilatation. These patients are depicted in the upper right quadrant of panel A in Figure 3, and it is suggested that this type of cardiomyopathy is a part of the continuous spectrum of LV dysfunction in CHF. Doppler recordings were available only in 5 of these 18 patients, and significant mitral regurgitation could therefore not be excluded by certainty among the other patients.

To diagnose IDCM, besides exclusion of specific causes of CHF (including alcohol and ischemic heart disease), it is implied that LV function is compared with a normal control group. In our study we used M-mode echocardiography and the Teichholz EF formula for evaluation of LV function, utilizing the 2.5th to the 97.5th percentile to delineate the normal ranges. Using the mean values ±2 SD yields similar results. It is suggested that both EF (<50%) and LV dimension (>32 mm/m²) should be outside the normal range to assign a diagnosis of IDCM. If other methods are used to assess LV function, similar comparisons with normal control values should be performed.

Limitations of the Study

The study population was confined to previously hospitalized patients, excluding mild forms of CHF. However, to test the possibility to extend the population further, we examined the only computerized outpatient record register in the region. No additional case of CHF or IDCM was revealed by this register. This reflects a tendency by the physicians to admit new patients with CHF aged 16 to 65 years to the hospital. Patients with CHF who were not hospitalized because of mild disease or patients dying outside the hospital before their conditions were diagnosed would not have been identified by this investigation. In this study, we chose to investigate the patients after the acute hospital admission, to be able to study them in a more stable phase of the disease. By this procedure, the most severely diseased patients died before investigation. However, most patients’ conditions improve following institution of treatment with modern cardiovascular drugs, and investigations during the phase of acute CHF would not be representative of the total CHF population.

The area of investigation was well defined and it is unlikely that more than a few patients from the area were hospitalized due to CHF outside the region only. Hospital care is almost free of charge in Sweden, but the patients are confined to visit the nearest county hospital, except in emergency cases. Even though our population was restricted to patients hospitalized below the age of 66 years, we were able to review the largest group of patients with idiopathic CHF, so far, in comparison with a randomly selected age- and sex-matched control group.

There are limitations in using echocardiography as a diagnostic tool, expressed by the fact that 13% of the patients could not be adequately investigated by M-mode or two-dimensional echocardiography. However, as yet there is no other method that is suitable for screening procedures. The present data are limited by lacking quantitative two-dimensional recordings and Doppler echocardiography, which are used routinely today. In the absence of LV aneurysm, M-mode echocardiography is a reliable tool to interpret LV function, and the time-resolution is superior to other noninvasive methods. Two-dimensional echocardiography is widely used for evaluating EF, but the method has not been validated for use in larger unselected populations or for the assessment of volumes. Doppler was not generally available at the time of investigation, but should have been of value in evaluating valvular and diastolic function. However, patients with echocardiographic findings suggesting the possibility of valvular heart disease were referred for an extended noninvasive evaluation, including Doppler.

Conclusions

Our study presents the largest echocardiographic study of patients with idiopathic CHF, and we were also able to compare the results with a random sample of normal subjects. To our knowledge, this is the first study to show that reductions of contractility and ventricular dilatation are truly continuous phenomena, and all grades were found in this large sample of patients. The continuous distribution made the proportion of the IDCM group highly dependent on the used control values. We presented reference values for the diagnosis of IDCM. Although one third of the patients had both LV dilatation and reduced EF consistent with IDCM, a simple combination of EF, LA dimension, and FTFF identified both systolic and
diastolic heart failure in most of the remaining patients. We suggest the term NDCM to describe this group.

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